

Evaluation of Canine Index and Intercanine Width to Establish Sexual Dimorphism among Three Different Populations

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ABSTRACT

Introduction: Dental evidence is valuable in the identification of individuals, especially following mass disasters. Among the teeth, canines have consistently shown the highest sexual dimorphism. In addition, canines are among the toughest teeth and less vulnerable to disease and decay.

Aim: Evaluation of canine index and intercanine distance (ICD) to establish sexual dimorphism among three different populations (Uttar Pradesh, Bihar, and Rajasthan).

Materials and methods: The present study was performed on 100 samples of full dentate casts from the archives of departments between the age group of 18 years and 45 years, randomly sampled with informed consent.

Results: In the current study, mean values were calculated for the right and left mesiodistal (MD) canine width, and the ICD measurements were obtained. The right and left dental indices were calculated from MD and ICD measurements. The canine indices and buccolingual (BL) canine widths were greater in males compared to females in the Uttar Pradesh population. The canine indices were higher in males in the Bihar and Rajasthan population. Buccolingual canine widths were not significant in different population groups based on gender. The canine indices also exhibited a higher significance in the Rajasthan population.

Conclusion: Standard mandibular canine index is a fast and easy method for determining sex in identification. However, advanced studies need to be conducted to support the results due to the limited sample size.

Keywords: Age estimation, Canine index, Forensic, Mandible.

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INTRODUCTION

The individuality of the human dentition frequently permits the forensic odontologists to reach a powerful opinion of combination in cases of identification and bite mark analysis. Such analysis can often be applicable during the investigation of violent crimes, principally those involving sexual assault. The high number of rape, murder, and child abuse cases has led to an advanced number of forensic cases being heard in courts. Analysis of the bite mark is the second principal responsibility of the forensic dentist. Sex assessment constitutes an important step in constructing a postmortem profile and is useful in identifying skeletal remains.¹ Teeth are the strongest structure in the human body in addition to their important functions in mastication and esthetics; the teeth may also be used as a weapon and, under certain conditions, may leave information as to the identity of the biter. Among the teeth, canines have consistently shown the highest sexual dimorphism. Additionally, canines are among the toughest teeth and less vulnerable to disease. Dental indices are derived from elemental mathematical combinations of linear measurements.^{2,3}

AIM AND OBJECTIVES

Aim

Evaluation of canine index and intercanine width to establish sexual dimorphism among three different populations.

Objectives

- To ascertain gender differences in dental indices by measuring MD width of canine
- To ascertain gender differences by measuring ICD of the permanent dentition

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- To compare BL width of canine in three different populations (Uttar Pradesh, Bihar, and Rajasthan) populations.

MATERIALS AND METHODS

The study sample from 3 different populations (Uttar Pradesh, Bihar, and Rajasthan) consisted of casts of 100 samples of full dentate casts from the archives of departments, comprising 50 males and 50 females. The sample distribution from departments of different colleges was as follows: Uttar Pradesh included 15 males and 18 females; Bihar included 15 males and 14 females; Rajasthan included 20 males and 18 females.



Fig. 1: Left MD canine width measurements using Vernier caliper

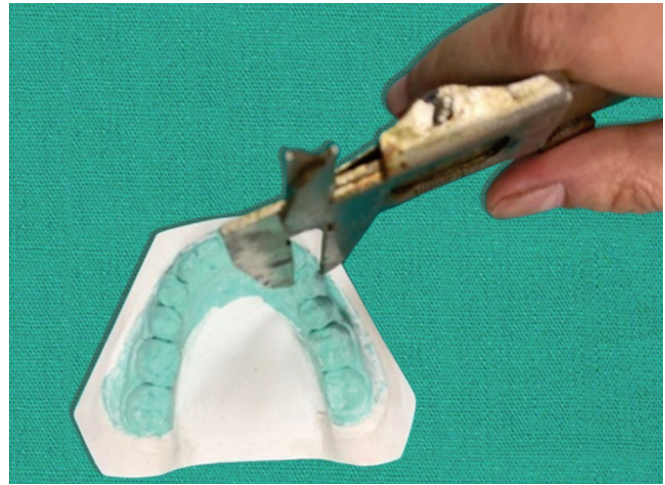


Fig. 2: Buccolingual width measurements using Vernier caliper

All the casts were of the patients in the age group of 18–45 years. Samples with normal over jet and overbite, without spacing in the anterior teeth and with normal molar–canine relationship, were included in the study. Samples with the presence of partially erupted teeth, with deleterious oral habits, and having teeth with severe attrition were excluded from the study.

All casts were of healthy samples, free from any diagnosed congenital abnormalities, inflammation, and trauma. All selected casts from the individuals were free of air bubbles or voids. On the study model, the following measurements were made for all subjects using vernier caliper. The measurements taken included right and left MD canine width (Fig. 1), and the ICD measurements were obtained using vernier caliper with calibration upto 0.01 mm (Fig. 2). The intercanine arch width was calculated from the cusp tip of canine on one side to the cusp tip of the canine on the opposite side. Right and left dental indices were calculated from MD and ICD measurements, canine index = MD width of canine/ICD.^{2–4} Right and left BL widths were measured (Fig. 3).

RESULTS

In this study, arithmetic means were calculated for the right and left MD canine width, and the ICD measurements were obtained using vernier caliper. The right and left dental indices were

calculated from MD and ICD measurements, canine index = MD width of canine/ICD and the right and left BL width were measured. Student’s *t*-test was used to compare the means of the intercanine and intermolar width in maxillary and mandibular arches for males and females.

All the comparison of means done was significant with “*p*” value <0.05. Right canine indices for male and female were 0.17 ± 0.13 , 0.27 ± 0.16 , 0.27 ± 0.20 and 0.24 ± 0.13 , 0.25 ± 0.14 , 0.24 ± 0.20 , respectively with significant *p* value < 0.05 (Table 1). Left canine indices in maxillary or mandibular arch for male and female were 0.26 ± 0.12 , 0.27 ± 0.13 , 0.27 ± 0.01 and 0.23 ± 0.13 , 0.24 ± 0.15 , 0.23 ± 0.23 , respectively, with significant *p* value < 0.05 (Table 2). Right BL canine width (mean) ± standard deviation for male and female in different population based on gender were 6.33 ± 0.59 , 6.49 ± 0.87 , 6.48 ± 0.60 and 6.08 ± 0.32 , 6.50 ± 0.72 , 6.05 ± 0.55 , respectively (Table 3). In addition, based on gender in different population groups, the left BL canine width for male and female were 6.29 ± 0.60 , 6.17 ± 0.83 , 6.40 ± 0.64 and 6.10 ± 0.36 , 6.38 ± 0.60 , 6.19 ± 0.39 , respectively (Table 4). However, the difference in intercanine width was found to be statistically non significant, i.e., 22.9 ± 1.3 .

Statistical Analysis

The statistical analysis for collaboration among right and left canine indices manifested significant difference between male and female subjects in all the population groups. The right central incisor (RCI) and left central incisor (LCI) were marginally greater in males compared to females as well as right and left BL canine width was also higher in males in the Uttar Pradesh population. Correspondingly, the RCI and LCI were higher in males when compared to females in Bihar and Rajasthan population. The BL canine widths were not

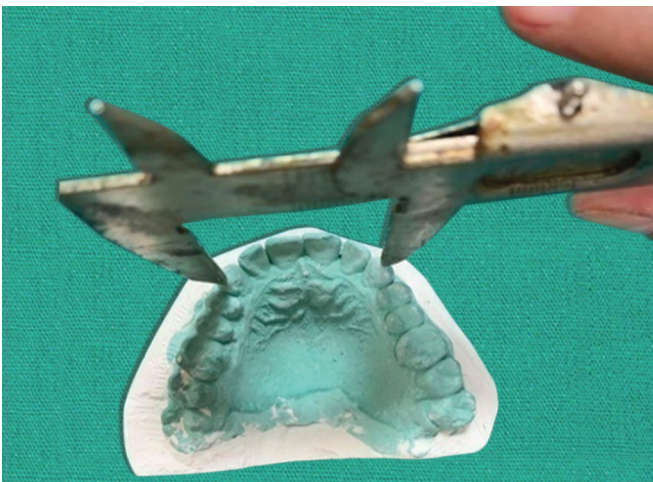


Fig. 3: Intercanine width measurements using Vernier caliper

Table 1: Right canine index in different population groups based on gender (canine index)

Population group	Right canine index (mean) ± standard deviation		<i>p</i> value
	Males	Females	
Uttar Pradesh	0.17 ± 0.13	0.24 ± 0.13	0.01*
Bihar	0.27 ± 0.16	0.25 ± 0.14	0.01*
Rajasthan	0.27 ± 0.20	0.24 ± 0.20	0.01*

*Significant *p* value <0.05

Table 2: Left canine index in different population groups based on gender

Population group	Left canine index (mean) ± standard deviation		p value
	Males	Females	
Uttar Pradesh	0.26 ± 0.12	0.23 ± 0.13	0.01*
Bihar	0.27 ± 0.13	0.24 ± 0.15	0.01*
Rajasthan	0.27 ± 0.01	0.23 ± 0.23	0.01*

*Significant (p < 0.05)

Table 3: Right BL canine width in different population groups based on gender

Population group	Right BL canine width (mean) ± standard deviation		p value
	Males	Females	
Uttar Pradesh	6.33 ± 0.59	6.08 ± 0.32	0.07*
Bihar	6.49 ± 0.87	6.50 ± 0.72	0.9*
Rajasthan	6.48 ± 0.60	6.05 ± 0.55	0.01*

*Not significant

Table 4: Left BL canine width in different population groups based on gender

Population group	Left BL canine width (mean) ± standard deviation		p value
	Males	Females	
Uttar Pradesh	6.29 ± 0.60	6.10 ± 0.36	0.18*
Bihar	6.17 ± 0.83	6.38 ± 0.60	0.29*
Rajasthan	6.40 ± 0.64	6.19 ± 0.39	0.17*

*Not significant

significant in different population groups based on gender. The right and left canine indices also exhibited a higher significance in Rajasthan population group as compared to the other two places. Also, the difference in intercanine width between different population groups was found to be statistically nonsignificant.

DISCUSSION

Dental evidence can be used as the sole technique of identifying a deceased person. Dental identification of humans may be required for a number of different reasons and in a number of different circumstances.^{4,5} Dental identifications have always played a key role in natural and man-made disaster situations and, in particular, the mass casualties normally associated with aviation

disaster. Dental indices were demonstrated to have progressive, developmental, and clinical significance.⁶ Prabhu et al. in their study observed that mandibular teeth were able to determine sex to greater levels compared to both the jaws taken together. Hence for optimum odontometric sex assessment in Indians, mandibular canines were considered to demonstrate the highest percentage of sexual dimorphism among all teeth which was similar to the present study.⁷ Rao et al. in their study (1989) predicted sex correctly in 86% of cases in the South Indian population using the mandibular canine index. In the current study, we examined mandibular canine index in males and females in three different populations and found remarkable difference between sexes in all the three. The present study documents the existence of a statistically significant, definite, sexual dimorphism in mandibular canines.^{8,9}

CONCLUSION

The resistance of teeth to postmortem insults provides them as a valuable tool in forensic identification. Some studies on dental sex dimorphism remain for the South-Asian populations which include the “canine index.” Standard mandibular canine index is a fast and easy method for determining sex in identification. However, advanced studies need to be conducted to support the results due to the limited sample size.

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